

What is claimed is:

1. A catheter for delivering agents to a defined biological space in vivo comprising:  
  
a catheter shaft having a proximal end and a distal end;  
  
a first balloon proximal to said catheter shaft distal end;  
  
a second balloon proximal to said first balloon;  
  
a third balloon located proximal to said second balloon;  
  
a first agent delivery segment on said catheter shaft between said first balloon and said second balloon; and  
  
a second agent delivery segment on said catheter shaft between said second balloon and said third balloon.
2. The catheter of claim 1 wherein the biological space is a blood vessel having side branches and the distance between said first balloon and said second balloon correlates with the average or typical distance between the blood vessel side branches.
3. The catheter of claim 1 wherein the biological space is a blood vessel having side branches and the distance between said second balloon and said third balloon correlates with the average or typical distance between the blood vessel side branches.
4. The catheter of claim 1 wherein said first agent delivery segment and said second agent delivery segment have orifices therein for delivering agents to the biological space.
5. The catheter of claim 1, further comprising marker bands on said catheter shaft.
6. The catheter of claim 1 wherein said catheter shaft further comprises a first balloon inflation lumen in communication with said first balloon, a second balloon inflation lumen in

communication with said second balloon, a third balloon inflation lumen in communication with said third balloon, and a fourth lumen in communication with an agent delivery source.

7. The catheter of claim 6, further comprising a plurality of ports at said catheter proximal end, said ports being in communication with at least one said four lumens.

8. The catheter of claim 6, wherein one of said ports is in communication with the agent delivery source and said fourth lumen for delivery of the agent to the biological space.

9. The catheter of claim 1, wherein the biological space is a coronary artery.

10. The catheter of claim 9, wherein the agent is an angiogenic agent.

11. The catheter of claim 9, wherein the agent is an anti-stenosis agent.

12. A catheter for delivering agents to a defined biological space in vivo comprising:

a first catheter shaft having a first shaft distal tip and a first balloon proximal to said first shaft distal tip; and

a second catheter shaft longitudinally movable with respect to said first catheter shaft, said second catheter shaft having a second shaft distal tip and a second balloon proximal to said second shaft distal tip.

13. The catheter of claim 12 wherein said first catheter shaft further comprises an agent delivery segment proximal to said first balloon, said agent delivery segment having orifices therein.

14. The catheter of claim 13 wherein said first catheter shaft further comprises a cuff proximal to said agent delivery segment.

15. The catheter of claim 14 wherein said cuff comprises a raised portion of said first catheter shaft which prevents said second catheter shaft from sliding over said orifices.

16. The catheter of claim 15 wherein said cuff is located on the perimeter of said first catheter shaft.

17. The catheter of claim 11 wherein said first catheter shaft comprises at least two lumens, a first inflation lumen in communication with said first balloon, and an agent delivery lumen in communication with an agent delivery source and said catheter second shaft comprises at least a second inflation lumen in communication with a second inflatable balloon.

18. The catheter of claim 11, wherein said second catheter shaft is longitudinally movable along said first catheter shaft.

19. A method for delivering agents to a defined biological space having side branches comprising:

(a) providing a catheter comprising:

a catheter shaft having a proximal end and a distal end;

a first balloon proximal to said catheter shaft distal end;

a second balloon proximal to said first balloon and placed at a distance relative to said first balloon to correlate with the average or typical distance between the side branches; and

a first agent delivery segment on said catheter shaft between said first balloon and said second balloon;

(b) guiding said catheter shaft distal end to a proximal end of a target segment in vivo,

(c) aligning said first and said second balloons in relation to the side branches to create a defined space within the target segment;

(d) inflating said first and second balloons;

(e) forming an agent delivery pocket in said defined space between said first and said second balloons;

(f) infusing an agent into an agent delivery pocket via orifices in said agent delivery segment;

(g) deflating said first and said second balloons; and

(h) withdrawing said catheter from the biological space.

20. The method of claim 18 wherein said first and second balloons are aligned in register with the side branches to create said defined space.

21. The method of claim 18 wherein said first and second balloons are aligned between the side branches and the target segment so that the side branches are beyond the terminus of each said balloon.

22. A method for delivering agents to a defined biological space having side branches comprising:

(a) providing a catheter comprising:

a catheter shaft having a proximal end and a distal end;

a first balloon proximal to said catheter shaft distal end;

a second balloon proximal to said first balloon;

a third balloon located proximal to said second balloon;

a first agent delivery segment on said catheter shaft between said first balloon and said second balloon; and

a second agent delivery segment on said catheter shaft between said second balloon and said third balloon;

- (b) guiding said catheter shaft distal end to a proximal end of a target segment in vivo,
- (c) aligning two or more of said first, second and third balloons in relation to the side branches to create a defined space within the target segment;
- (d) inflating at least two of said first, second and third balloons;
- (e) forming at least one agent delivery pocket in said defined space between at least two of said first, second and third balloons;
- (f) infusing an agent into said at least one agent delivery pocket via orifices in at least said first or said second agent delivery segment;
- (g) deflating said at least two of said first, second and third balloons; and
- (h) withdrawing said catheter from the biological space.

23. The method of claim 21 wherein said first, second, and third balloons are aligned in register with the side branches to create said defined space.

24. The method of claim 21 wherein said first, second, and third balloons are aligned between the side branches and the target segment so that the side branches are beyond a terminus of each said balloon.

25. The method of claim 21 wherein said first, second and third balloons are placed at a distance relative to each other to correlate with the average or typical distance between the side branches.

26. The method of claim 21 wherein prior to said withdrawing step (h), another target segment is selected and steps (b) through (g) are repeated.

27. The method of claim 21 wherein prior to said withdrawing step (h), other target segments are selected and steps (b) through (g) are repeated as many times as necessary.

28. A method for delivering agents to a defined biological space comprising:

(a) providing a catheter comprising:

a first catheter shaft having a first shaft distal tip, a first balloon proximal to said first shaft distal tip, and an agent delivery segment having orifices therein, proximal to said first balloon; and

a second catheter shaft longitudinally movable with respect to said first catheter shaft, said second catheter shaft having a second shaft distal tip and a second balloon proximal to said second shaft distal tip;

(b) guiding said first shaft distal tip to a proximal end of a first target segment in vivo;

(c) inflating said first balloon on the proximal end of said first shaft;

(d) adjusting said second shaft longitudinally relative to said first shaft to position said second balloon at the distal end of the first target segment;

(e) inflating said second balloon to form a closed agent delivery pocket between said first balloon and said second balloon;

(f) infusing an agent into the agent delivery pocket via said orifices in said agent delivery segment of said first shaft;

(g) deflating said first and second balloons; and

(h) withdrawing said catheter from the biological space.

29. The method of claim 27 further comprising the steps of aligning said first balloon in register with a side branch within the first target segment prior to inflating said first balloon, and aligning said second balloon in register with a side branch within the first target segment prior to inflating said second balloon.

30. The method of claim 27 wherein prior to said withdrawing step (h), another target segment is selected and steps (b) through (g) are repeated.

31. The method of claim 29 further comprising the steps of aligning said first balloon in register with a side branch within the second target segment prior to inflating said first balloon, and aligning said second balloon in register with a side branch within the second target segment prior to inflating said second ball.

32. The method of claim 27 wherein prior to said withdrawing step (h), other target segments are selected and steps (b) through (g) are repeated as many times as necessary.

33. The method of claim 31 further comprising the steps of aligning said first balloon in register with a side branch within the second target segment prior to inflating said first balloon, and aligning said second balloon in register with a side branch within the second target segment prior to inflating said second balloon.

34. The method of claim 27, wherein the biological space is a coronary artery.

35. The method of claim 27, wherein the biological agent is an angiogenic agent.

36. A method for delivering agents to a target segment within a biological vessel comprising:

(a) injecting contrast dye into the vessel in order to determine the location of side branches relative to the target segment of the vessel;

(b) using said contrast dye to obtain images of side branch runoff;

(c) inserting a balloon catheter having two or more balloons into the vessel;

(d) keeping said balloons deflated and advancing said balloon catheter proximal to the vessel target segment;

(e) adjusting said balloon catheter so that when said balloons are inflated the side branches are blocked;

(f) inflating two or more of said balloons to create the target segment; and

(g) injecting a therapeutic agent within the target segment.

37. The method of claim 35 further comprising the step of injecting additional contrast dye into the vessel prior to adjusting said balloon catheter in order to determine the locations of said balloons relative to the side branches.

38. The method of claim 35 further comprising the step of injecting additional contrast dye into to vessel after said balloons are inflated to test for runoff of the contrast media prior to injecting said therapeutic agent.

39. The method of claim 35 further comprising the step of providing a guide catheter capable of introducing contrast media and a balloon catheter into the vessel and thereafter injecting said contrast dye via said guide catheter and introducing said balloon catheter through said guide catheter.